

# Regular Polygons

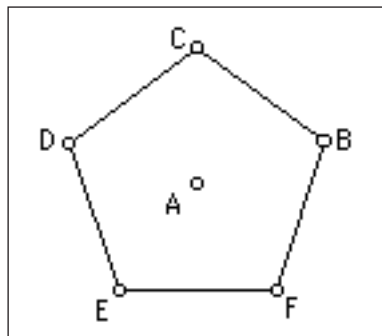
## Activity 47

### Construct

Construct points  $A$  and  $B$ . Using  $A$  as a center of rotation, rotate the image of  $B$   $72^\circ$ . Repeat until the image point is concurrent with the original point  $B$ . Connect the points in the order in which they were created to form regular pentagon  $BCDEF$ .

Construct diagonals  $\overline{DB}$  and  $\overline{CF}$  and label their point of intersection  $G$ . Hide point  $A$ .

Measure the sides and angles of  $DGFE$ .



### Investigate

1. Classify  $DGFE$  as specifically as possible. Manipulate the figure and verify that this classification holds.

The following questions will help you justify the result found in Exercise 1.

2. Find the measure of each angle of pentagon  $BCDEF$ .
3. Classify triangles  $\triangle DBC$  and  $\triangle CFB$ .
4. Use your answers to Exercises 2 and 3 to determine the measures of  $\angle CDB$  and  $\angle CFB$ .
5. What are the measures of  $\angle GDE$  and  $\angle GFE$ ? angle  $E$ ?
6. Based on your answer to Exercise 5, find the measure of  $\angle DGF$ .
7. Determine the relationship between  $\overline{DE}$  and  $\overline{EF}$ .
8. Use your answers to Exercises 5 through 7 to justify the conclusion found in Exercise 1.

### Extend

Use rotations to construct regular hexagon  $ABCDEF$  with diagonals  $\overline{AD}$  and  $\overline{BE}$  intersecting at  $G$ .

9. Classify  $AGEF$  as specifically as possible. Manipulate the figure and verify that this classification holds.
10. Construct a regular heptagon. Draw two diagonals that produce the same quadrilateral.
11. Repeat Exercise 10 for a regular octagon.
12. Make a conjecture as to how to draw diagonals of regular polygons in order to produce the type of quadrilateral formed in this activity.